

AN ANALYSIS OF A  
VA/DOD HIGH-TECH JOINT VENTURE  
AT WOMACK ARMY MEDICAL CENTER

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## **Abstract**

In today's highly competitive health care industry cooperation and collaboration between health care organizations does not happen over night. This has been the case between medical facilities within the Department's of Defense (DOD) and Veterans Administration (VA). However, as these two federal agencies attempt to cope with downsizing and insufficient funding, in a health care environment which is increasingly dependent upon expensive technology, they are turning to resource sharing agreements and joint ventures to enhance cost efficiency.

According to the August 1992 issue of U.S. Medicine, DOD and VA hospitals had signed and executed 660 locally initiated sharing agreements, and have recently begun to enter into capital intensive joint ventures such as diagnostic imaging centers and even construction of hospitals.

The primary objectives of VA/DOD joint ventures are to improve services to both VA and DOD beneficiaries through increased availability and accessibility to new technologies and services, and to reduce costs to the government by minimizing duplication and inefficient utilization of health care resources (Ramon, 1992).

Even though studies to determine the cost effectiveness of VA/DOD joint ventures are absent in the literature, lobbying efforts by special interests groups to expand the "joint venture" concept have intensified with the expectation that cost savings will be realized by participating organizations (Tokarski, 1989).

Using a specific example of a local Magnetic Resonance Imager (MRI) joint venture between the Fayetteville Veterans Administration Medical Center (FVAMC) and Womack Army Medical Center (WAMC), the management problem was to determine how effective this joint venture has been at improving patient access to MRI technology and reducing the overall cost of providing MRIs to local VA and DOD beneficiaries.

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## **Introduction**

In April 1991 Womack Army Medical Center (WAMC) and the Fayetteville Veterans Administration Medical Center (FVAMC) entered into a high-tech joint venture for the purchase of a MRI. The actual purchase price of the MRI was shared equally by WAMC and the FVAMC. The MRI is located at WAMC and WAMC is responsible for providing necessary staffing, maintenance, and all operating expenses. In return, WAMC receives 6 of the 8 available slots during an eight hour shift, and FVAMC receives the remaining 2 slots. The FVAMC will reimburse WAMC for each MRI performed at an agreed upon rate; however, since the percentage of usage of the MRI by FVAMC will not equal the percentage of purchase price paid, WAMC gives FVAMC a credit against the dollar value contributed by FVAMC. The MRI became operational in July 1992. The conditions which prompted the study are threefold:

(1) Workload reports from the first six months of operation indicate that active duty soldiers are utilizing nearly all available MRI slots, with a 4-6 week active duty backlog.

(2) WAMC is still spending a considerable amount of supplemental care funds on MRI procedures for dependents and retirees.

(3) The Commander and Chief of Staff are reluctant to operate the MRI during a second 8 hour shift until it is determined to be a cost effective program.



## PROBLEM STATEMENT

The management problem is to determine how effective the WAMC/FVAMC MRI joint venture has been at improving patient access to MRI technology and reducing the overall cost of providing MRIs to local DOD and VA beneficiaries.

## LITERATURE REVIEW

It is common knowledge that two of the biggest problems facing health care in America are skyrocketing health care costs and inadequate access for millions of Americans. Concerns about health care in this country were exemplified in the 1992 presidential campaigns where the promise of health care reform became a major topic in many debates.

According to the U.S. Department of Commerce, health care expenditures in 1992 rose even more than projected for a total of \$838.5 billion, representing a record 14 percent of the gross domestic product (GDP). This compares to 1960 when health care accounted for only 5 percent of the GDP (Rowley, 1992). A report released January 6, 1993 by the Office of Management and Budget, forecasts a 112 percent increase in total health costs between Fiscal Years (FYs) 1992 and 1998 if current spending levels continue unchecked. Among the factors cited by the report as contributing to the rising cost of health care was the increased use of "sophisticated and high-priced equipment."

Equal in severity to the high cost of health care in this country is the lack of access to health care by millions of Americans. Experts estimate there are approximately 35 to 37

million Americans without health insurance and an additional 80 million who are underinsured (Karlin, 1991 and Rowley, 1992). These are two of the primary reasons, health care reform has become an item of intense national interest and debate.

A common theme throughout many health care reform plans is the idea of delivering health care through "health care networks" where local hospitals cooperate and collaborate with one another in order to reduce waste and inefficiencies brought on by duplication and overuse of expensive medical technologies and services (AHA News, 4 Jan 93). The idea of developing strategic linkages and alliances, better known as collaboration, is not new to the health care industry. Since the 1970s, hospitals have recognized that collaboration offered improved opportunities for survival, growth, and a place on the competitive edge. In addition, these collaborative efforts among hospitals benefitted the communities they served through reduced costs and additional health care services (McManis and Stewart, 1991).

The "medical arms race" of the 1980s resulted in the more frequent occurrence of shared services, joint ventures, and mergers of health care organizations. Hospitals soon realized that they could not be all things to all people, nor could they afford to purchase every piece of expensive new technology by themselves. Even if they could, the cost of the new technology would ultimately be passed on to the consumers, making the institution too expensive and, in the long run, less competitive (McManis and Stewart, 1991).

According to numerous health care authorities, the number of joint ventures and multi-institutional alliances are expected to increase steadily in the future (Cherskov, 1991). However, according to Smith, Piland, and White (1989), joint ventures and multi-institutional arrangements may not be the panacea many anticipate. They estimate that as many as 7 out of 10 joint ventures will fall apart or lose money because of flawed business plan (e.g. there was a misreading of the opportunity or the idea was ill-conceived) or due to improper tactical planning and neglected operations.

Like the civilian health care sector, the Departments of Defense and Veterans Administration are faced with many problems dealing with health care cost and access. The DOD and the VA operate the largest health care systems in the United States. In fiscal year 1987, the DOD cared for 1 million inpatients and had 50 million outpatient visits on a \$12 billion budget. The VA cared for 1.3 million inpatients and had 18.5 million outpatient visits on a \$9.7 billion budget (Simmons, 1989). The VA has 172 medical centers compared to the DOD's 168 hospitals.

Unlike the civilian health care sector, cooperation and collaboration between DOD and VA hospitals is a fairly recent phenomenon. In the past many barriers separated these two systems, primarily the lack of financial incentives for local hospitals to share services. Hospitals wishing to share services were required to use rigid national "interagency" reimbursement rates which were ill-suited to local conditions.

In addition, the perceptions and jealousies of different constituencies presented problems with collaboration between the two agencies. The DOD's primary constituency is young and healthy, while the VA's primary constituency is made up of primarily aging male veterans with chronic conditions. Similarly, the budgets of the two agencies are under the jurisdiction of different congressional committees, and constituent interest groups have different goals (Simmons, 1989). For these reasons, until Congress passed the VA/DOD Health Care Resources Sharing Law (PL 97-174) in 1982, cooperative efforts between the two agencies were virtually non-existent (U.S. Congress 1982).

This public law mandated federal health care facilities, located within 50 miles of one another, to work together to accomplish three broad objectives: (a) improve beneficiary availability and accessibility to services, (b) contain costs, and (c) efficiently utilize federal services (Lindberg and Sylvester, 1992).

As a result of this law the DOD and VA developed the VA/DOD Health Care Resource Sharing Program. The program's intent is to encourage the exchanging, purchasing, or sharing of medical services between the two federal agencies, in hopes of reducing government health care costs and expanding access for agency beneficiaries (Ramon, 1992). As of July 1992, VA and DOD hospitals had entered into 660 sharing arrangements, all of which were locally initiated (U.S. Medicine, 1992). In 1991 the two

agencies began to form high-tech joint ventures involving the joint funding of new and very expensive high-tech equipment such as MRIs and even a Positron Emission Tomography (PET) scanner (Johnsson, 1991).

Even though neither the VA's Resource Sharing Service nor the Office of the Assistant Secretary of Defense (Health Affairs) collects data on reductions in federal health care costs and improved beneficiary access associated with sharing agreements and joint ventures, certain special interests groups and members of Congress are pushing for increased sharing activities and joint ventures between the two agencies (GAO Report, 1988). These initiatives support the need for studies to identify the magnitude of any cost savings or improved beneficiary access made through "joint ventures."

#### PURPOSE OF THE STUDY

The purpose of the study is to determine the effectiveness of this VA/DOD joint venture at Womack Army Medical Center in improving patient access to MRI technology and in reducing the overall cost of providing MRIs to local VA and DOD beneficiaries.

#### METHODS AND PROCEDURES

In order to determine how effective this VA/DOD joint venture has been at improving patient access to MRI technology and reducing the overall cost of providing MRIs to local VA and DOD beneficiaries, a seven phase analysis will be conducted. This study will be both quantitative and qualitative in nature.

### Phase 1 - Literature Search

Journal articles and other available information publications released within the past several years will be reviewed to determine trends in joint ventures between hospitals and to identify any successes or failures they may have experienced. Information on economic and utilization trends on MR imaging will also be collected.

### Phase 2 - Information Gathering

All available information pertaining to joint ventures between VA and DOD hospitals will be requested from appropriate points of contact at Health Services Command, Office of the Surgeon General, Office of the Secretary of Defense (Health Affairs), and the Veterans Administration. In addition, information from other DOD medical treatment facilities which currently have or are in the process of establishing high-tech joint ventures with the VA, will be requested.

### Phase 3 - Interviews

Personal interviews with Womack radiology staff members will be conducted to ascertain problems or successes with the joint venture since its implementation, and assist in the data collection process. In addition, interviews with representatives from the Fayetteville Veterans Administration will be held to get the VA's perspective on the joint venture.

### Phase 4 - Review of Existing Agreement and Current Operations

The existing WAMC/FVAMC MRI joint venture agreement and current operations will be reviewed to determine if the terms of

the agreement are being met by both parties.

#### Phase 5 - Review of Workload and Utilization Data

An analysis of magnetic resonance imaging workload and utilization data will be conducted over a 12 month period comparing workload and utilization prior to and after the on-site MRI became operational. This analysis will include all procedures done utilizing supplemental care funds during the same time period.

Data collected will be broken down by beneficiary category, region of body imaged, specialty of referral source, and inpatient vs. outpatient procedures. In addition, weekly patient volume and patient throughput (number of procedures per hour) will be examined to measure Womack's operational efficiency compared to national trends.

To determine the extent to which the new MRI has become an add-on or replacement technology, the workload and utilization data of Womack's Computed Tomography (CT) Scanner and various orthopedic procedures will be examined.

#### Phase 6 - Economic Analysis

An economic analysis will be conducted to determine actual costs per procedure done on the MRI located at Womack, and how these costs compare to the projected costs, which are the basis for the VA's reimbursement rate to WAMC, and the cost of procedures performed on the civilian economy. This analysis will also determine the extent of any CHAMPUS or supplemental care funds recaptured due to the joint venture, and the amount of

supplemental care funds still used to purchase MRIs on the local economy.

#### Phase 7 - Accessibility and Availability

Accessibility and availability of MRI procedures will be looked at to determine any changes as a result of the joint venture. Mean scheduling delays or waiting times will be measured for procedures sent out on supplemental care and for in-house procedures. This will be done for both WAMC and VA beneficiaries prior to and after the joint venture.

#### EXPECTED FINDINGS AND UTILITY OF RESULTS

Through this study, I expect to determine whether this particular high-tech joint venture with the VA has been effective in reducing federal health care expenditures and improving beneficiary access to care as it was intended to do. In addition I hope to identify some of the important lessons learned from this joint venture which could be used in the planning and implementing of future high-tech joint ventures.

Secondary findings will, hopefully, include how to improve upon existing policies and procedures in order to make the MRI facility more efficient and cost effective. It should also help in the decision making process of implementing a second shift.

### **Results**

#### Literature Search

A literature search was conducted to determine trends in joint ventures between VA and DOD hospitals and identify any successes or failures they may have experienced, particularly in



the area of high-tech joint ventures.

The types of sharing agreements and joint ventures negotiated between the VA and DOD serve a wide variety of local needs. Initial agreements between the two agencies normally cover the sharing of a limited number of diagnostic services. Broader agreements involving millions of dollars and covering a multitude of services often follow (Simmons, 1989).

A typical broad based agreement exists between the Memphis, Tennessee VA Medical Center and the U.S. Naval Hospital in Millington, Tennessee. The Navy provides blood and gynecological services to the VA, while the VA provides inpatient and routine outpatient services to the Navy.

In North Chicago, Illinois, the VA medical center and the Great Lakes Naval Hospital have a shared staffing arrangement. The VA assigns orthopedists, internists, and other specialists to the Navy hospital. This allows the VA physicians greater exposure to a wider range of patients and an improved residency training program, and the Navy receives increased access to highly trained specialists for less money.

Other hospitals take advantage of highly specialized services available in their region. For example, the Dayton, Ohio VA Medical Center manages hyperbaric oxygen therapy referrals from other VA medical centers to the U.S. Air Force Hospital in Wright-Patterson, Ohio. Through this arrangement the VA estimates savings of over \$700,000 per year.

Another interesting development between the two agencies,

receiving a great deal of publicity, is the VA/DOD Joint Venture Construction Program. The intent of this program is to avoid duplication of medical facilities, expand services to federal beneficiaries, and contain federal health expenditures. The most publicized of these construction joint ventures took place in New Mexico.

In Albuquerque, New Mexico, Kirkland Air Force Base Hospital and the VA Hospital were joined, creating the New Mexico Regional Federal Medical Center. This joining meshed resources of a 475-bed VA hospital with a 40-bed Air Force hospital. The Air Force operates 40 beds on the sixth floor of the new VA hospital, while the VA provides all ancillary support to the in-house Air Force staff. Tertiary care is either purchased from the VA or the community. The Air Force manages the emergency room and is building a new outpatient clinic next to the hospital. The union of services made it unnecessary for a proposed renovation of Kirkland Air Force Base Hospital, saving approximately \$26 million (Lindberg and Sylvester, 1992).

According to Simmons (1989), the success of the VA/DOD Resource Sharing Program could be measured by the fact that by fiscal year 1988, every VA medical center within a 50 mile radius of a military hospital was sharing at least one medical resource with a military hospital. However, even though numerous accounts of shared services and construction joint ventures were found in the literature, only one account of a high-tech joint venture between the VA and DOD could be found.

This high-tech joint venture between the two agencies involved the purchasing of a new PET scanner at the University of Texas Health Science Center, San Antonio, Texas. According to officials involved in the project, this joint venture represented the first time a piece of high-tech equipment was jointly funded by the VA and DOD. The joint venture was sponsored by the 626-bed Audie L. Murphy Memorial Veterans Hospital, 843-bed Wilford Hall U.S. Air Force Medical Center, and the University of Texas Health Science Center. According to Jose Coronado, director of Audie L. Murphy Veterans Hospital, the cost of such a program was too great for one institution to bear. He added that, a joint venture allowed the agencies to share the costs and improve access to PET technology for all beneficiaries.

While the PET scanner joint venture represented the first VA/DOD high-tech joint venture, according to Mr. Adolph Ramon, VA/DOD Sharing Program Coordinator at Health Services Command, the MRI joint venture between WAMC and the FVAMC represents the first VA/DOD high-tech joint venture within the Army Medical Department. This fact strengthens the need for studies to determine the cost effectiveness and effects on access of VA/DOD joint ventures.

#### Information Gathering

Although high-tech joint ventures are fairly common in the civilian healthcare sector, it is still a relatively new concept for the U.S. Army Medical Department. The literature indicates that the Air Force has taken the lead in forming joint ventures

with the VA, however the number of Army hospitals considering this option appears to be increasing. The main impetus for this interest seems to be both politically and economically motivated.

As mentioned previously, passage of the VA/DOD Health Care Resources Sharing Law (PL 97-174) in 1982, has encouraged a much closer relationship between hospitals of the two agencies. As a result of this law, a Memorandum of Understanding between the VA and the DOD, providing VA/DOD Health Care Resources Sharing Guidelines, was signed by both parties in July 1983. While these guidelines did delineate the purpose and authority for sharing agreements, they did not address the joint procurement of health care resources by the VA and DOD.

In 1988, Information Papers from the Office of the Surgeon General (OTSG) and Health Services Command (HSC) were circulated to provide information and generate support for the VA/DOD Resource Sharing Program. However, it was not until January 1992 that these Information Papers began to address the joint purchasing of resources. Finally, in September 1992, a Memorandum of Understanding (MOU) was signed by the Assistant Secretary of Defense (Health Affairs) and the Chief Medical Director, Department of Veterans Affairs to establish policy and procedures for joint venture construction projects. Unlike the previous resource sharing guidelines and information papers, this MOU provides federal facilities with information on how to plan, program, and execute joint venture construction projects.

In addition to the recently established PET scanner joint

venture between the VA, Air Force, and a civilian Medical University in San Antonio, Texas, the only other information found on VA/DOD high-tech joint ventures, was in the form of an MOU between the 1ST Medical Group, Langley AFB, the Naval Hospital, Portsmouth, the McDonald Army Community Hospital, Fort Eustis, and the Veteran's Affairs Medical Center, Hampton. According to this MOU dated March 1990, the parties mentioned above, desired to participate in a joint venture to purchase an MRI. The VA would pay 50% of the purchase price, while the Air Force and Army would each pay 25%. Since the MRI would be located at the Naval Hospital, the Navy would pay for all site preparations and future maintenance. Unfortunately, after nearly a year of planning and negotiating an agreement, the Navy backed out and purchased an MRI on their own. No other information on VA/DOD high-tech joint ventures could be found.

#### Interviews

Personal interviews with WAMC and FVAMC staff members, directly involved in the execution of the MRI joint venture and sharing agreement, were conducted to identify perceived problems or successes since its implementation. Interviews conducted with representatives from Womack included LTC Mooney, Chief of Radiology, MAJ Jordan, Staff Radiologist, 1LT Zales, Administrative Officer for Radiology, and Ms. Darlene Copeland, MRI Appointment Clerk. In addition, Ms. Deborah Nasekos, Contracting Officer at FVAMC, was interviewed to get the VA's perspective on the joint venture.

In general, representatives from WAMC felt that the joint venture is beneficial to WAMC in that a greater scope of services can now be provided at the hospital, and it gives staff members the opportunity to work with new technologies. Concerns of over utilization were expressed by the radiologist overseeing MRI operations. He also stressed a need for better screening mechanisms to ensure appropriateness of referrals. Personnel responsible for scheduling MRI appointments have experienced difficulties in managing appointments due to VA appointment "no-shows", which will be addressed in the discussion and recommendations section of this paper.

The VA's perspective is that the joint venture provides the local veteran and military populations with a state-of-the-art technology in a cost effective manner. They also feel that the joint venture has resulted in improved communication and coordination between the two facilities, and as budget restrictions in the federal sector increase, joint ventures between DOD and VA facilities will become increasingly important.

#### Review of Existing Agreement and Current Operations

WAMC and the FVAMC entered into a joint venture for the purchase of an MRI in April 1991. The actual purchase price of the MRI was \$3,076,780 which was funded equally by WAMC (\$1,541,780 or 50.1%) and FVAMC (\$1,535,000 or 49.9%). The actual funding transaction took place at Department of Army level.

Based on this joint venture a resource sharing agreement,

originally signed in April 1992, was developed. According to the agreement WAMC would be responsible for operation of the MRI (to include staffing, personnel training, maintenance, and supplies). Hours of operation were projected to be from 0730 to 1630 hours, Monday through Friday with the exception of Federal Holidays and designated training/maintenance periods. It was estimated that 8 patients per 8 hour shift could be processed with a utilization ratio of 1 for FVAMC and 7 for WAMC, or 260 MRI scans annually for FVAMC and 1820 scans annually for WAMC, for a total of 2,080 MRI scans per year.

According to the agreement, FVAMC would reimburse WAMC for utilization of the MRI at an agreed upon rate per scan. However, since FVAMC's utilization rate would never equal FVAMC's share of the purchase cost, they would be given a credit amount against the dollar value contributed to purchase the MRI. In essence, the FVAMC is reimbursing WAMC for their utilization of the MRI, however, it is a debit figure, which is being subtracted from a credit amount.

At the time of the original agreement, FVAMC requested 1 scan per day, however in the agreement there is a statement indicating that workload and cost estimates would be reviewed and updated prior to each fiscal year. Consequently, in August 1992, the FVAMC submitted a revision to the VA/DOD Resource Sharing Agreement to increase the number of MRIs from 1 scan per day to 2 scans per day beginning in FY 93 (see Appendix A). This would change the MRI utilization ratio to 2 scans per day for FVAMC and

6 scans per day for WAMC. The modification to the agreement was signed and approved by the Commander of Womack in October 1992.

In order to compute the number of years required before FVAMC will deplete the credit balance and begin reimbursing WAMC for utilization of the MRI, it was necessary to calculate a cost per scan. The cost per scan was calculated based on the estimated total operating costs to WAMC, divided by the number of projected scans taken in a fiscal year. The FY 92 estimated cost per scan was \$146.63 (see Appendix B), and the FY 93 estimated cost per scan was \$176.68 (see Appendix C). However, after several weeks of operation, costs to operate the MRI were more clearly defined, and revised cost estimates for FYs 93 and 94 increased the FY 93 cost per scan by \$106.37, from \$176.68 to \$283.05 (see Appendix D) and the FY94 cost per scan by \$30.58, from \$353.58 to \$384.06 (see Appendix E).

Even though it is stated in the sharing agreement that cost and workload data are estimates only, and should be reviewed and updated prior to each new fiscal year, when the revisions of the costs per scan were discussed with the VA, they would not agree to change the estimated cost per scan for FY 93, but would agree to change the cost per scan for FY 94, based on actual cost adjustments. The FVAMC based this decision on a verbal commitment made by WAMC's Chief, Resource Management Division (RMD), that the original estimates would be honored for FY 93. A decision was made by WAMC not to press the issue and would honor the verbal commitment of the original estimate of \$176.68



per scan for FY 93. As stated in the agreement, using the annual workload estimate of 520 scans for FVAMC, at a rate of \$176.68 for FY 93, rather than \$283.05, reduced the debit to FVAMC's credit by \$55,312.

After reviewing the terms of the MRI joint venture agreement for FYs 92 and 93 a review of current operations was conducted to determine if the terms were being met by both parties. During this process it was discovered that for the most part, the terms were being followed by both WAMC and FVAMC, with the exception of one area.

According to the agreement, in FY 93 WAMC would use the estimated cost per scan of \$176.68 to calculate the dollar value to be debited from the credit amount of FVAMC's original investment. However, it was discovered that in FY 93 WAMC was not using the agreed upon rate of \$176.68, but continued to use the FY 92 rate of \$146.63. If this rate continues to be used for the remainder of FY 93, and retroactive adjustments are not made to the amounts already debited against the credit amount, it will result in a reduction of \$15,626.60, which should have been debited against the credit amount.

#### Review of Workload and Utilization Data

To assess the impact the on-site MRI had on workload and utilization, an analysis of MRI workload and utilization, prior to and after the MRI became operational, was conducted. For purposes of this study, the time period 1 January 1992 to 31 January 1993 was used as a data base. Thus, comparisons of MRI

workload and utilization were made 6 months prior to and after the on-site MRI became operational in July 1992.

Prior to July 1992, all patients requiring an MRI were sent to one of the two MR imaging facilities in Fayetteville, and were funded with supplemental care dollars. This was done to allow WAMC to maintain control over the patient's health care, because the other alternative was to discontinue treatment and send the patient out on CHAMPUS, thus increasing the overall cost of care to the government.

The first part of the MRI workload analysis consisted of a review of the MRIs sent out on supplemental care from 1 January 1992 to 30 June 1992. To accomplish this it was necessary to review all MEDDAC Fort Bragg Form 1995s (Control Form For Civilian Medical Care) which were on file in the RMD.

Table 1 shows that during this time frame a total of 388 MRI scans were sent out on supplemental care. As one might expect, the over whelming majority of scans were for active duty soldiers, performed on an outpatient basis. It is also not surprising that 83% of the referrals came from two services - Orthopedics and Neurology. Based on studies found in the literature, anatomic regions examined were grouped into 5 regions: head, spine, extremities, abdomen/pelvis, and chest. It was interesting to find that 37% of all exams were for extremities.

The second part of the MRI workload analysis consisted of reviewing documentation to determine the amount of MRI scans sent

out on supplemental care following the date when the on-site MRI became operational. This was accomplished by reviewing the MEDDAC Fort Bragg Form 1995s from 1 August 1992 to 31 January 1993. A review of this documentation revealed that a total of 113 scans were sent out on supplemental care during this time period. This reflected an overall 71% decrease in the amount of MRI scans performed using supplemental care funds, from the 6 months prior to the on-site MRI becoming operational. A further analysis is included in Table 2.

The final part of the workload analysis involved an analysis of the MRI scans performed utilizing WAMC's on-site MRI. This was accomplished by utilizing data collected from the Military Expense and Performance Reporting System (MEPRS) workload reports on the MRI, and an automated MRI patient roster. An analysis of in-house workload during the period studied, is provided in Table 3.

Figure 1 displays number of MRI scans performed for WAMC from January 92 through January 93, broken down by supplemental care, in-house, and total.

TABLE 1

MRIs Purchased on Supplemental Care From 1 Jan 92 - 30 June 92

<u>Ref</u>	<u>AD/DA/RET</u>	<u>Inpt</u>	<u>Outpt</u>	<u>Head</u>	<u>Spine</u>	<u>Extrem</u>	<u>Abd/Pel</u>	<u>Chest</u>	<u>Total</u>
ORT	196/12/5	0	213	1	66	139	6	0	213(55%)
NEU	62/21/26	17	92	64	40	0	1	4	109(28%)
OTH	27/22/17	4	62	34	22	6	1	3	66(17%)
TOT	285/55/48	21	367	99	128	145	8	7	388(100%)
	74%/14%/12%	5%	95%	26%	33%	37%	2%	2%	

Note. Ref = Referral Source; AD = Active Duty; DA = Dependents of Active Duty; RET = Retirees, Dependents of Retirees and Survivors; Inpt = In-patient; Outpt = Out-patient; Extrem = Extremities; Abd/Pel = Abdomen/Pelvis; ORT = Orthopedics; NEU = Neurology; OTH = Others; TOT = Total.

Referral category listed as "Others" includes 14 services, with no one service accounting for over 3% of total scans.

TABLE 2

MRIs Purchased on Supplemental Care From 1 Aug 92 - 31 Jan 93

<u>Ref</u>	<u>AD/DA/RET</u>	<u>Inpt</u>	<u>Outpt</u>	<u>Head</u>	<u>Spine</u>	<u>Extrem</u>	<u>Abd/Pel</u>	<u>Chest</u>	<u>Total</u>
ORT	0/10/9	0	19	0	8	12	0	0	19(17%)
NEU	4/8/8	1	19	18	2	0	0	0	20(18%)
OTH	2/47/25	11	63	49	20	3	1	1	74(65%)
TOT	6/65/42	12	101	67	30	15	1	1	113(100%)
	5%/58%/37%	11%	89%	59%	26%	13%	1%	1%	

Note. Ref = Referral Source; AD = Active Duty; DA = Dependents of Active Duty; RET = Retirees, Dependent of Retirees, and Survivors; Inpt = In-patient; Outpt = Out-patient; Extrem = Extremities; Abd/Pel = Abdomen/Pelvis; ORT = Orthopedics; NEU = Neurology; OTH = Others; TOT = Total.

TABLE 3

In-house MRIs From 1 Aug 92 - 31 Jan 93

Ref	AD/DA/RET	Inpt	Outpt	Head	Spine	Extrem	Abd/Pel	Chest	Total
ORT	261/5/1	5	262	44	132	91	0	0	267(48%)
NEU	107/18/7	37	95	62	67	3	0	0	132(24%)
OTH	106/58/14	27	131	75	57	18	4	4	158(28%)
TOT	474/61/22	69	488	181	256	112	4	4	557(100%)
	85%/11%/4%	12%	88%	32%	46%	20%	<1%	<1%	

Note. Ref = Referral Source; AD = Active Duty; DA = Dependents of Active Duty; RET = Retirees, Dependents of Retirees, and Survivors; Inpt = In-patient; Outpt = Out-patient; Extrem = Extremities; Abd/Pel = Abdomen/Pelvis; ORT = Orthopedics; NEU = Neurology; TOT = Total.

Referral category listed as "Others" includes 18 services with no one service accounting for over 5% of total scans.

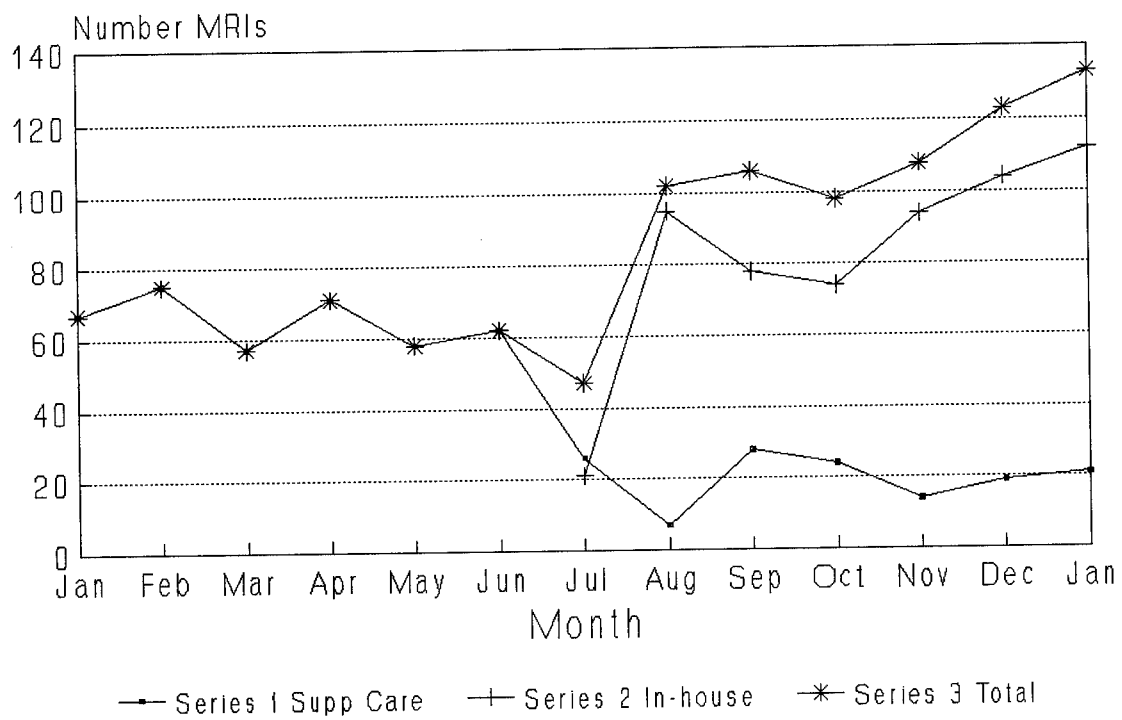


Figure 1. MRI volume for WAMC from January 92 - January 93.

Utilization statistics for WAMC's MRI from 1 August 92 to 31 January 93 indicate that only 73% of the projected number of MRIs to be done during this period were performed. Of the 920 MRIs projected to be performed (189 or 20.5% for FVAMC, and 731 or 79.5% for WAMC), only 676 were actually performed (119 or 18% for FVAMC and 557 or 82% for WAMC). The actual average daily utilization rate during this period was 5.8 scans per day (4.8 for WAMC and .96 for FVAMC). The average throughput (procedures per hour), was 0.73 procedures per hour. Table 4 compares WAMC's MRI utilization with national trends found in an MRI utilization analysis conducted by Evens and Evens in 1990.

To determine the extent of which the new MRI has functioned in an additive rather than substitutive manner, an analysis of CT procedures during the 12 month period of study was conducted. According to the literature, it is widely believed that MR imaging outperforms CT in a large number of central nervous system applications, therefore any impact MR imaging has on the use of CT is most likely to be observed in head and spine studies.

Since the Orthopedic and Neurology services were responsible for ordering 83% of the MRI studies prior to the on-site machine becoming operational, and 72% of the studies on the on-site MRI, these two services were targeted in the CT study, with particular attention given to their referral patterns for head and spine studies. Table 5 shows CT referral patterns for Orthopedics six months prior to and six months after the on-site MRI became



operational. Table 6 shows the CT referral patterns for Neurology during the same time period. As indicated by Tables 5 and 6, Orthopedics had a decline in CT head studies by 60%, a decline in spine studies by 79%, and a 44% reduction for all CT studies.

Similarly, Neurology exhibited a 10% decline in CT head studies, a 38% decline in spine studies, with only a 10% decline in all studies.

However, when comparing the total number of CT scans conducted by all services, six months prior to and six months after WAMC acquired an MRI, there was a 15% increase in total CT studies performed (from 2060 to 2372).

#### Economic Analysis

Economic analyses of the MRI joint venture were conducted from three different perspectives - WAMC's, FVAMC's, and the federal government as a whole. Tables 7 & 8 compare MRI utilization and cost projections for WAMC, without and with the joint venture respectively.

Even with an on-site MRI, WAMC continued to purchase certain MRIs using supplemental care funds. These were primarily for patients requiring sedation or the use of contrast medium, or extremely large individuals. Due to these additional requirements the average cost per scan for these patients increased to \$516 up from \$480. During the six months following the on-site MRI becoming operational, WAMC purchased 113 scans for \$58,264. However, as of May 93, WAMC had taken steps to

TABLE 4

MRI Utilization: WAMC vs. 1990 National Trends

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<u>Variable</u>	<u>WAMC(Mean)</u>	<u>NATIONAL(Mean)</u>
Scheduled days/week	5.0	5.6
Scheduled hours/week	40.0	66.0
Patients examined/day	5.8	12.1
Patients examined/hour	0.73	1.0

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TABLE 5

Orthopedics CT Scans by Body Region, From January 92 - January 93

<u>Region</u>	<u>1JAN92-30JUN92</u>	<u>1AUG92-31JAN93</u>	<u>% CHANGE</u>
Head	15	6	-60%
Spine	67	14	-79%
Others	26	41	+58%
Total	108	61	-44%

TABLE 6

Neurology CT Scan by Body Region From January 92 - January 93

<u>Region</u>	<u>1JAN92-30JUN92</u>	<u>1AUG92-31JAN93</u>	<u>% CHANGE</u>
Head	157	141	-10%
Spine	21	13	-38%
Others	14	19	+36%
Total	192	173	-10%

TABLE 7

WAMC MRI Utilization and Cost Projections With No Joint Venture


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<u>Fiscal Year</u>	<u>Annual Volume</u>	X	<u>Cost per Scan</u>	=	<u>Annual Cost</u>
FY 93	900		\$480		\$ 432,000
FY 94	1032		480		495,000
FY 95	1188		480		570,240
FY 96	1368		480		656,640
FY 97	1572		480		754,560
FY 98	1812		480		869,760
FY 99	2076		480		996,480
FY 00	<u>2388</u>		480		<u>1,146,240</u>
Total	12,336				\$5,921,280

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Note. Annual volume of MRIs sent out on Supplemental Care is based on an average volume of 65 scans per month for the six months prior to the joint venture, with a 15% increase per year, based on discussions with WAMC staff.

The cost per scan of \$480 is based upon a 1990 agreement with the two imaging facilities in Fayetteville, with an assumption that this rate would not increase over time.

TABLE 8

WAMC MRI Utilization and Cost Projections With Joint Venture


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<u>Fiscal Year</u>	<u>Annual Workload</u>	<u>Annual Operating Costs</u>
FY 93	2080	\$ 555,000
FY 94	2080	922,732
FY 95	2080	944,985
FY 96	2080	968,421
FY 97	2080	993,110
FY 98	2080	1,019,128
FY 99	2080	1,046,555
FY 00	<u>2080</u> WAMC      VA	<u>1,075,477</u>
Total	16,640 (12,480 + 4160)	\$7,525,408

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Total Cost per Scan: \$7,525,408 divided by 16,640 = \$452.25  
 (Total operating costs divided by total workload)

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Note. Annual workload is based upon original estimates.  
 Annual operating costs are based upon original estimates for FYs 93 & 94, with annual increases of 7% supply costs and 3.2% personnel costs, as per guidance from Health Services Command.  
 (Annual Operating Costs = supplies + personnel + maintenance + cost of initial investment divided by 8 years)

reduce the number of MRIs sent out, and were averaging approximately 10 MRIs per month for an average cost per scan of \$516. At this rate, over an 8 year period, total cost for MRIs purchased downtown would equal \$522,664. This is assuming a monthly volume of 10 scans, at a constant purchase price of \$516, over the 7 1/2 year period [ $\$58,264 \text{ Aug92-Jan93} + (10 \text{ per mo} \times \$516 \times 6 \text{ mos}) + 10 \text{ per mo} \times \$516 \times 7 \text{ yrs}$ ] = \$522,664.

Total projected volume & cost for MRIs for WAMC during this 8 year period is: Volume = 12,480 on-site + 1013 Supp Care = 13,493 scans; Cost = \$7,525,408 on-site + \$522,664 Supp Care = \$8,048,072.

Next, an economic analysis comparing MRI utilization and cost projections without and with the joint venture, was conducted for the FVAMC. Prior to the MRI joint venture with WAMC, the FVAMC was purchasing approximately 260 MRIs annually from civilian sources, at an average rate per scan of \$525. Therefore, over an 8 year period, with no changes in annual volume or charges per scan, the FVAMC would spend a total of \$1,008,000 for 2080 scans ( $260 \text{ scans} \times \$525 \times 8 \text{ yrs} = \$1,008,000$ ).

If FVAMC's utilization rate increased as projected, to an annual volume of 520 scans, at the same cost per scan of \$525, total costs over an 8 year period would be \$2,184,000 for 4160 scans purchased from civilian sources ( $520 \text{ scans} \times \$525 \times 8 \text{ yrs} = \$2,184,000$ ).

Table 9 shows MRI utilization and cost estimates for the FVAMC with the joint venture in place.

TABLE 9

FVAMC MRI Utilization and Cost Projections With Joint Venture


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<u>Fis Yr</u>	<u>Price X Volume</u>	<u>FVAMC Credit</u>	<u>Debit</u>	<u>Balance</u>
FY 92	\$146.63 X 260/4 qtrs	\$1,535,000	\$ 9,531	\$1,525,469
FY 93	\$176.68 X 520		91,874	1,433,595
FY 94	\$353.48 X 520		183,809	1,249,785
FY 95	\$364.17 X 520		189,280	1,060,505
FY 96	\$375.44 X 520		195,228	865,276
FY 97	\$387.31 X 520		201,401	663,874
FY 98	\$399.82 X 520		207,906	455,967
FY 99	\$413.00 X 520		214,760	241,207
FY 00	\$426.91 X 520		221,993	19,213

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Note. Costs per scan and workload are based upon original estimates stated in the agreement, with annual increases of 7% supply costs and 3.2% personnel costs.

TABLE 10

Overall Economic Analysis of MRI Joint Venture


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<u>HOSPITAL</u>	<u># SCANS</u>	<u>COSTS WITH J.V.</u>	<u>COSTS W/O J.V.</u>	<u>SAVINGS/LOSS</u>
WAMC	13,493	\$8,048,116	\$6,476,640	- \$1,571,476
FVAMC	4,225	\$1,535,000	\$2,218,125	+ \$ 683,125
TOTAL	17,718	\$9,583,116	\$8,694,765	- \$ 888,351

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Table 10 compares the costs of the projected number of scans for WAMC and the FVAMC, both with and without the joint venture, and shows any savings or losses as a result of the joint venture. As shown in the table, the joint venture does not appear to be cost effective for WAMC or the federal government.

#### Accessibility and Availability

In addition to reduced healthcare costs to the government, another selling point of VA/DOD joint ventures and sharing agreements, has been the promise of improved accessibility and availability of services to eligible beneficiaries. Prior to measuring accessibility and availability of services, a clear definition of these terms must be found. According to the Quality Management Division of Health Services Command,

Accessibility is the ability to access our system, to make contact with the health care system, obtain an opportunity to see a health care provider, physically get to the site of the health care, and actually receive the health care.

Various issues which could be measured to determine levels of accessibility include: appointment waiting times, barriers such as requirements for consults, copayments or nonavailability statements, location of hospital, and availability of parking and transportation. For purposes of this study, appointment waiting times were used to measure the level of accessibility to MRI services prior to and after the on-site MRI became operational.

Prior to the MRI joint venture with the VA, patients requiring an MRI examination were sent to one of the two MRI facilities located in Fayetteville - Medical Arts Imaging (MAI), and Cape



Fear Valley Medical Center (CFVMC). Neither facility is more than a 10 to 15 minute drive from Fort Bragg. Table 11 shows routine appointment waiting times for MAI and CFVMC from January 1992 to June 1992, and Table 12 shows waiting times from August 1992 to January 1993. Urgent appointments could be made at either facility within a 24 hour time period.

Appointment waiting times for the on-site MRI at WAMC fluctuated dramatically during the six months looked at by this study. This can be attributed to various factors such as low operational efficiency during implementation phase, and increased demand for examinations. The mean routine appointment waiting times for MRI examinations for WAMC beneficiaries from August 1992 to the end of January 1993, was 19.3 days with a range of 5 to 40 days.

Prior to the MRI joint venture with WAMC, FVAMC beneficiaries requiring an MRI examination were also referred to one of the two imaging facilities in Fayetteville. According to local VA officials routine appointment waiting times for VA beneficiaries were similar to those experienced by WAMC beneficiaries, approximately 5 - 10 days. Once the on-site MRI became operational at WAMC, FVAMC beneficiaries have experienced virtually no delays in getting appointments and in many cases can get routine appointments in 1 to 2 days. This stems from the fact that FVAMC is guaranteed 2 appointment slots per day as per the sharing agreement with Womack.

TABLE 11

Appointment Waiting Times for MAI and CFVMC From January 92 -  
January 93

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<u>Variable</u>	<u>Mean</u>	<u>Range</u>
Appt Wait time (MAI)	6.5days	3-13
Appt Wait time (CFVMC)	9.0days	3-16

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TABLE 12

Appointment Waiting Times for MAI and CFVMC From August 92 -  
January 93

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<u>Variable</u>	<u>Mean</u>	<u>Range</u>
Appt Wait time (MAI)	3.6days	2-20
Appt Wait time (CFVMC)	6.2days	4-9

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Availability of health care resources has been defined by the Quality Management Division at Health Services Command, as the following:

Availability is the component of access that describes the capacity of our health care system. Are there enough of the right providers, enough space, the right equipment, and support personnel?

Accordingly, to get an indication of the availability of health care, one could measure issues such as staffing levels, productivity, utilization, occupancy, and waste (no-shows). Since MRI examinations were not available in WAMC's or FVAMC's direct health care system prior to the joint venture, the availability of MRI's has increased as a result of the joint venture. However, this is not to imply that the availability of MRIs was inadequate when both agencies were sending patients downtown.

### **Discussion**

A seven phase analysis was conducted to determine the impact of a VA/DOD joint venture on the cost of, and access to, MRI technology for local VA and DOD beneficiaries. Since most of the findings of the analyses were discussed previously, the discussion portion of this paper will focus on results of the workload and utilization analysis, and the economic analysis.

#### **Workload & Utilization**

As depicted in Figure 1, within six months of acquiring an MRI, overall MRI usage at WAMC increased by nearly 73 percent. This study did not attempt to determine whether this increased usage was justified or medically appropriate. Similarly this finding alone does not necessarily mean that physicians with

access to on-site MR imaging equipment are overutilizing this procedure. In fact, the differences found in usage could just as well be attributable to a tendency for those without such access to underuse MRI examinations. Whether either or both of these effects are involved, the resultant findings do not appear to be merely artifactual, but rather a reflection of an underlying association between the availability and use of MR imaging.

Even though this study did not attempt to establish a causal relationship between increased access to technology and higher usage, the findings are consistent with Hardison's law that "the more available or accessible a test or procedure, the greater the indication to do it" (Hardison, 1979). Additionally, a study conducted by Strasser, Bass, and Brennan (1987), testing the hypothesis that on-site radiology facilities are an important determinant of usage, found that patients with chest-related diagnoses were 2.4 times more likely to have a chest film in the presence of on-site facilities.

It is interesting to note that six months prior to WAMC acquiring an MRI, 83% of all MRI requests came from two services, Orthopedics (55%) and Neurology (28%), with all other services accounting for only 17% of all MRI requests. In comparison, in the six months following WAMC's acquisition of an MRI, Orthopedics and Neurology accounted for only 65% of all MRI requests, including those purchased with Supplemental Care dollars, while all other services accounted for 35% of all requests. This finding is not surprising given the emergence of new applications

for MR imaging as experience with the technology increases.

When MRI technology first became available in this country, nearly 80% of the scans performed were of the head. Subsequently, dramatic increases in MR imaging of the knee and spine coincided with a growing literature on these applications (Bautz, Schectman, Elinsky, & Pawlson, 1992). A national study conducted on the use of MR imaging in 1990, found that 73% of all procedures were related to the head (40%) or spine (33%), but this was a proportional decrease from previous years. This same study found that 17% of all examinations were for studies of bones and joints (Evens & Evens, 1991). WAMC's utilization by body region was similar to national trends in that during the first six months of operation, 78% of the studies were for head (32%) and spine (46%), while extremities accounted for 20% of the studies. The fact that WAMC conducts a proportionately higher number of spine and extremity studies, is more than likely a result of the higher number of orthopedic injuries presented to the hospital due to numerous airborne jump injuries.

As shown in Table 3, overall, 88% of patients imaged at WAMC were outpatients, while 12% were inpatients. This compares very close with national trends of 86% outpatient and 14% inpatient (Doughty, Nash & Gift, 1992).

With WAMC's acquisition of an MRI, there were slight differences in overall percentages of scans performed by category of beneficiary. Tables 1-3 show that prior to the purchase of the MRI, 74% of all scans were for Active Duty (AD), 14% were for

Dependents of Active Duty (DA), and 12% were for Retirees, Dependents of Retirees, and Survivors (RET). Following the purchase of the MRI, percentages of all scans (On-site + Supplemental Care), were as follows: 72% AD, 19% DA, and 9% RET. However, as the use of supplemental care funds becomes more restrictive retirees and their dependents may experience difficulties in obtaining access to the on-site MRI due to the higher percentages of active duty and dependents receiving appointments.

The fact that WAMC's operational efficiency as defined by the number of exams per unit of time or throughput, is considerably lower than the national mean, is consistent with the literature on this topic. For instance, in 1985, MR imaging facilities typically performed 0.6 procedures per hour; this increased to 0.8 procedures per hour in 1987 and slightly higher than one procedure per hour in 1990 (Evens & Evens, 1991). As of 31 January 1993, Table 4 shows that WAMC was conducting 0.73 procedures per hour.

The costs of adopting new technologies may be partially offset by their replacement of preexisting modalities. However, there is evidence that many new technologies actually function in an additive rather than substitutive manner. This is particularly true in the early stages of the new technology's adoption and when the preexisting modality is noninvasive (Eisenberg, Schwartz & McCaslin, 1989). One study of referrals to an MRI found initial rates of additive CT/MR ordering of approximately 50% for head and 40% for spine scans, however, these rates decreased over

the two year study period (Peddecord, Janon & Robins, 1988).

During the first six months in operation, WAMC experienced similar results for inpatients who received head MRI scans. During this time period, 62 inpatients received head MRI exams. Of that 62, 22 or 35% of the patients had also received a CT scan of the head. This is not to imply that use of CT before MR imaging is not always clinically indicated or is inappropriate; it is simply an observation.

With the increased use of MR imaging for orthopedic problems, particularly those relating to bones and joints, studies have been conducted to determine the extent MR imaging has supplanted or supplemented diagnostic arthroscopy. One such study, found that 51.4% of patients studied, avoided a potentially unnecessary diagnostic arthroscopy, as a result of having a prior MRI scan (Ruwe, Wright, Randall & others, 1992). Another observation made while conducting this study, was that during the six months prior to WAMC gaining an MRI, 333 arthroscopies were conducted, while during the same time period, a total of 104 MRI scans of lower extremities were conducted. However, in the six months following the purchase of the MRI, 254 arthroscopies were performed at WAMC, while 137 MRI scans of the lower extremities were conducted. Even though an attempt to establish a causal relationship was not conducted, it is noted that as MRIs of the lower extremities increased by 32%, the number of arthroscopies decreased by 24% during the same time period. Clearly, studies to determine any relationship between MR imaging and diagnostic

arthroscopies at WAMC, are needed.

As shown in Tables 5 & 6 CT studies for Orthopedics and Neurology did decrease as MRI usage increased, however, the overall number of CT scans conducted by all services during this time period increased by 15%. Thus, the rapid increase in the use of MR during the study period was not offset by a concomitant decrease in CT use, which could have resulted in some cost savings for diagnostic radiological procedures at Womack.

#### Economic Analysis

Economic analyses relating to the MRI joint venture were conducted for WAMC, FVAMC, and the federal government as a whole. Several assumptions pertaining to volume of procedures and costs were made in these analyses. The rationale and justification for these assumptions will be discussed in further detail at this time.

In order to conduct an economic analysis of this joint venture for WAMC, it was first necessary to look at the level of MRI usage by WAMC prior to purchasing an MRI. In this way, usage trends could be determined, and future projections of usage could be made. Once this was accomplished a comparison of the costs of purchasing this projected number of scans on the economy, versus, the costs of purchasing and operating an MRI could be done. Tables 7 & 8 show the results of such an analysis.

In Table 7, two assumptions were made pertaining to annual volume and costs per scan, had there not been a joint venture. Annual volume projections were based on estimates given by



physicians on WAMC's staff. A 15% increase in annual volume per year, took into consideration the increasing applications for MRI technology, and the screening and approval mechanisms in place on the use of supplemental care funds. The assumption that the average cost per scan of \$480 would not increase over the 8 year period was based on the fact that attempts to increase this rate have not occurred in the past 3 years, and based on a conversation with an official from one of the imaging facilities. According to this official, upgrades to the equipment have drastically increased throughput which actually results in a lower cost per scan to the facility, and an improved profit margin on previously established charges. Therefore, there was no indication that the rate would increase during the eight year period.

In Table 8, which shows costs and workload projections with the joint venture, assumptions were made when computing the annual operating costs. As per guidance from Health Services Command, supply costs could be expected to increase by 7% per year, and personnel costs increase by 3.2% per year. Additionally, included in the annual costs, was the cost of the original investment carried over the 8 year period. The annual operating costs calculated in this study are similar to those found in the literature for civilian MRI facilities. For instance, in one national study on economics and use of MRIs in the United States, it was reported that the average annual operating costs of MRI units in 1990, was \$1,338,309. Of course this figure included

the cost of equipment and building depreciation which are not normally taken into consideration in military cost estimates. However, if the costs of depreciation are subtracted from this figure the annual costs were still \$909,143 in 1990 (Evens & Evens, 1991).

The fact that WAMC continued to purchase MRIs from civilian sources, after the on-site MRI became operational, was probably not anticipated in original cost estimates. Regardless, an assumption was made that WAMC would continue to send certain cases downtown, particularly patients requiring sedation, and extremely large or overweight patients. The rate of 10 scans per month over the 8 year period was based on a review of supplemental care documents from August 1992 to May 1993.

With all assumptions taken into consideration, it was estimated that with the joint venture, WAMC would spend nearly \$8,048,072 for 13,493 scans, over an eight year period.

Even if it were determined that this increased usage was medically necessary and appropriate, the same number of scans could have been purchased from civilian sources for \$6,476,640. However, it should be noted that since the initial funding for the MRI was done at Army level, the cost of capital would not ordinarily be included in WAMC's annual operating cost estimates. Even so, if the initial investment of \$1,541,780 was deducted from the total estimated annual operating costs, the figure would still be \$6,506,292, which is still \$29,652 more than the cost of purchasing the MRI exams downtown. It should also be noted that

when computing the cost estimates found in Table 8, the original cost estimates for FYs 93 & 94 were used, as shown in Appendices C & D. If the adjusted cost estimates as shown in Appendices E & F were used, the annual operating costs found in Table 8 would be significantly higher.

When conducting an economic analysis of the joint venture for FVAMC the costs per scan to be debited against their credit amount were based on original cost estimates with 7% and 3.2% increases annually for supplies and personnel respectively. However, the Army's cost of capital for the initial investment was not included in the calculations used in Table 9. Based on the assumption that the FVAMC's increased usage of 520 scans per year, would not increase or decrease over the 8 year period, FVAMC would spend \$1,535,000 for 4225 scans.

This same number of scans purchased on the economy, assuming a constant price of \$525 per scan, would cost the FVAMC \$2,218,125 over an 8 year period. Basically, the FVAMC was able to double their usage of MRI procedures, while reducing the cost of doing so by \$683,125 ( $\$2,218,125 - \$1,535,000 = \$683,125$ ).

Additionally, as shown in Table 9, at an annual usage rate of 520 scans over the 8 year life of the agreement, FVAMC will nearly deplete its credit balance and achieve payback.

An overall economic analysis of the MRI joint venture, was conducted to determine if the overall cost to the government, of providing MRI procedures to local VA and DOD beneficiaries, had been reduced or increased as a result of the joint venture. As

shown in Table 10, taking all assumptions of the study into consideration, findings show that the joint venture was not effective in reducing costs to the government, but actually increased the overall costs by \$888,351.

### **Conclusions and Recommendations**

The management problem in this study was to determine the effectiveness of this VA/DOD joint venture in improving patient access to MRI technology and reducing the overall cost to the government, of providing MRI examinations to local VA and DOD beneficiaries. Results of this study indicate that the MRI joint venture has been successful in improving beneficiary access to MRI technology in terms of allowing more patients to receive MRI examinations. However, when access is measured by appointment waiting times, MRI appointment waiting times for WAMC beneficiaries, have actually increased as a result of the joint venture. In contrast, access to MRI technology for VA beneficiaries has increased, both in terms of increased utilization and decreased waiting times, as a result of the joint venture.

Additionally, even though the joint venture appeared to be cost effective for the VA, costs to WAMC and the federal government for providing MRI services, actually increased as a result of the joint venture.

Recommend that prior to considering future joint ventures with the VA or any other organization, a detailed economic analysis be conducted to determine potential impacts of the joint venture, and if it is in the best interests of WAMC and the

federal government. Even though procurement joint ventures with the VA allow for the increased diffusion of expensive technologies, at issue is how military treatment facilities decide to add new services and equipment - and what these decisions mean in terms of systemwide costs. Federal agencies and hospitals should not act as isolated economic entities focused only on their own financial well-being, as is often the case. Finding a balance between cost-efficiency and cutting edge technology is a difficult task to say the least, however, as budgets and resources continue to decline, it will become a necessity. Additional recommendations relating to the joint venture agreement include:

1. Prior to FY 94 workload and cost estimates stated in the agreement should be amended to accurately reflect true utilization and cost data.
2. In the agreement under Description of Services subparagraph f. Scheduling, should be amended, allowing WAMC to charge the VA for "No Shows" if sufficient prior notification is not provided by the VA.
3. Responsible individuals should review the agreement and accurately debit FVAMC's credit amount according to the agreed upon rate.
4. Representatives from Resource Management Division, Information Management Division, Radiology Department, and MRI appointment clerks, should meet to discuss measures to improve the automated MRI appointment system, to ensure accurate workload information is captured and reported in MEPRS and to WAMC's

management analysts.

5. Establish protocols and clinical guidelines for ordering MRI exams which can be used by Radiologists in screening referrals for medical necessity and appropriateness. Even though evaluation of the cost-effectiveness of MR scanning for various indications is complicated by the ongoing evolution of MR technology, the profound cost implications of continued unrestrained utilization exemplifies the need to formulate rational guidelines on its use.

6. Suspend plans to implement a second shift until methods to improve the operational efficiency of current operations are exhausted, and an appropriate need is determined based on sound clinical data. This is especially important considering one of HSC Commander MG Cameron's acceptable budge-cutting proposals - "Reduce ancillary services to essential levels, eliminating nice-to-know tests and studies."

## Appendix A

### WAMC/FVAMC MRI RESOURCE SHARING AGREEMENT



VA/DEPARTMENT OF DEFENSE S ARRING AGREEMENT

1. A proposed agreement must be signed by both parties and submitted to the approving authorities in each agency. Normally, agreements will go into effect 46 days after receipt of the agreements by the approving authorities provided no disapproval has been transmitted in writing to one or both parties signing the agreement. Agreements will go into effect earlier than the 46-day period if approvals are obtained from both agency approving authorities. Agreements may go into effect more than 46 days after receipt if a later date is indicated in box two.

2. If acquisition of additional resources is required, approval must be obtained for the additional resources from the regional office prior to submitting the proposal.
3. The providing organization will prepare a SF-1080 and send it to the receiving organization's office to be billed. Documentation for audit purposes must accompany the SF-1080.

1. A. AGREEMENT NUMBER (Leave blank)		1. B. AMENDMENT NUMBER (Leave blank)		2. AGREEMENT PERIOD (Month/Year)	
92/FRS/181				7 / 1 / 92 to 8 31 / 2000	
3. VA FACILITY (Name/Address)				4. TYPE OF ACTION (Mark "X")	
Veterans Affairs Medical Center 2300 Ramsey Street Fayetteville, NC 28301				Modification	
5. DOD FACILITY (Name/Address)					
US Army MEDCEN (W36QX9) (Womack Army Medical Center), Fort Bragg, NC 28307-5000					
6. DIRECT PAYMENTS TO: (Name/Address)					
See Attachment A, 9a.					
7. OFFICE TO BE BILLED/BILLING FREQUENCY (Name/Address)					
See Attachment A, 9a.					

**B. GENERAL PROVISIONS:** (to be included in all agreements)

8. GENERAL PROVISIONS: (to be included in all agreements)
- a. The authority for this agreement is Public Law 97-174, "Veterans Administration and Department of Defense Health Resources Sharing and Emergency Operations Act," 38 U.S.C. 5011 and the VA/DoD Health Care Resources Sharing Guidelines which are in the Memorandum of Understanding between VA and DoD, dated July 29, 1983.
- b. Amendments to this agreement shall be submitted for approval as a new sharing agreement pursuant to section 3-101 of the VA/DoD Sharing Guidelines. ~~Respective parties shall be responsible for the costs of the agreement and the costs of the agreement shall be borne by the parties in accordance with the provisions of the agreement. If the agreement is terminated, each party will be liable only for payment in accordance with provisions of the agreement. The agreement shall be terminated prior to the effective date of the termination date.~~
- c. In the event of war or national emergency, this agreement may be terminated immediately upon written notice by the Department of Defense.
- d. The agreement is subject to the availability of funds for the period after September 30 in succeeding fiscal years.

## 9. OTHER PROVISIONS

See Attachment A.

**CONTINUE ON REVERSE.**



Attachment A

9. OTHER PROVISIONS continued:

e. Procedure for handling collections: The providing facility will prepare a Standard Form 1080 and send it to the receiving facility's office to be billed. Bills for Fayetteville Veterans Affairs Medical Center (FVAMC) should be forwarded monthly to the Chief, Fiscal Service, Veterans Affairs Medical Center, 2300 Ramsey Street, Fayetteville, NC 28301. Documentation for audit purposes will accompany the Standard Form 1080. The documentation will cite/include as a minimum the following information:

- (1) The specific DOD/VA facility agreement concerned and the time period it covers.
- (2) The name and social security number of the military or VA beneficiary receiving the services.
- (3) The date the services were furnished.
- (4) The specific types of services rendered and the quantity of each such service.
- (5) The DOD/VA per procedure rate for the service and the total costs (itemized bill). VAMC credit, as detailed in Attachment C, should be listed.
- (6) The specific appropriate reimbursement accounts to be credited (e.g., local, O&MA, and MPA appropriations) and the dollar amount to be credited to each.
- (7) The DOD/VA point of contacts and telephone numbers of the office responsible for the Standard Form 1080 preparation and related inquiries.
- (8) Any additional instructions relating to billing procedures which may be established by DOD/VA specific regulations.

f. Separation of interagency and facility specific billings/reimbursements: In addition to services which may be exchanged locally under this health resource sharing agreement at the agreed rates, the Veterans Affairs and Military Departments routinely exchange services on an interagency basis at annually determined per diem rates. The provisions of both interagency and agreement related services may or may not be the same type services as those exchanged under this agreement. Although interagency billings/reimbursements are based on DOD/VA facility input, they may be centrally managed. Therefore, the parties will establish internal controls to preclude double billings/reimbursements at both the facility and interagency level for the same services.

g. Availability of funds: That portion of this agreement pertaining to the period beginning October 1 is subject to the availability of the next Fiscal Year funds. No services will be performed by the parties after September 30 until specifically authorized by the Director/Commander of each facility. Both parties shall annually review this agreement prior to the beginning of the fiscal year and/or 120 days prior to its termination date to insure that the resources being provided are in accordance with the agreement.

h. Medical records/data management information: Clinical and other medical records pertaining to patients receiving treatment under this agreement shall be exchanged to facilitate patient care and management of the health care program. Finance and management information may be shared if necessary to meet reporting requirements or insure the efficient use of resources.

i. Qualifications: The physicians furnishing services under this contract must be credentialed and meet Department of the Army qualifications and/or be licensed to practice in any State, Territory or Commonwealth of the United States or the District of Columbia. Both parties will provide each other evidence of full, unrestricted license of each physician at time of renewal of contract.

#### 10. DESCRIPTION OF SERVICES:

a. Purpose: To delineate the maintenance, operation, personnel and access to the Magnetic Resonance Imager (MRI) jointly purchased by the Fayetteville Veterans Affairs and Womack Army Medical Center as per the Memorandum of Understanding signed April 15, 1991. Womack Army Medical Center (WAMC) shall provide the health care services delineated below to the beneficiaries of the Fayetteville Veterans Affairs Medical Center (FVAMC) on a referral basis.

b. Personnel: WAMC will be responsible for providing all credentialed and/or certified personnel necessary to support the MRI. These personnel include, but are not limited to, radiologist, imaging technologist, and any clerical/administrative support personnel. WAMC will provide professional interpretation and will return hard-copy film with transcript to VAMC.

c. Training: Training for VAMC Radiologists and Technologists will be offered by WAMC as staffing allows. This may include but is not limited to MRI image interpretation and equipment operation/image acquisition.

d. Maintenance: WAMC will be responsible for all routine and remedial maintenance to include all associated expenses.

e. Imaging Hours: The MRI facility will run from 0730 to

1630 hours, Monday through Friday except Federal Holidays and designated training/maintenance periods. No "on-call" studies will be offered after hours. In the event WAMC decides to reduce the operating hours of the MRI for whatever reason, the VA will not experience any reduction of MRIs as defined in paragraph f below.

f. Scheduling: Eight (8) patients per day will be imaged on the following schedule:

0730 - 0930	2 WAMC patients
0930 - 1130	2 VAMC patients
1130 - 1230	Lunch
1230 - 1630	4 WAMC patients

In the event the VA does not use their allotted time for any particular day, that time may be scheduled on another day. If an emergency MRI is required, the staff at both WAMC and VAMC will take the necessary mutually agreeable steps to rearrange scheduling to accommodate the emergency need.

g. MRI Down-Time: During down-time for equipment maintenance or repairs, each facility (VAMC and WAMC) will bear its own fiscal responsibilities for sending MRI patients to other hospitals on a fee for service basis.

h. Patient Transport: Transport of VA patients to and from the FVAMC will be accomplished by the WAMC Ambulance Section as stated in the Resource Sharing Agreement. Appropriate medical support will be provided by FVAMC.

i. Quality Improvement: The medical facilities shall maintain utilization reviews and quality assurance programs to insure the necessity, appropriateness, and the quality of health care service provided under this agreement meet the requirements and guidelines delineated in the most recent edition of the JCAHO Accreditation Manual.

j. Liability: The provisions of direct health care to beneficiaries under this agreement is within the scope of duties or employment of employees of the providing agency. Claims for injury arising from such health care will be processed by the providing agency in accordance with its existing claims regulations.

k. Description of Services:

DESCRIPTION OF SERVICES TO BE PROVIDED BY DOD (WOMACK ARMY MEDICAL CENTER (WAMC))	ESTIMATED QUANTITY DAILY	ACTUAL COST OF SERVICES	REIMBURSE- MENT RATE
Magnetic Resonance Imaging	2	\$146.63	\$146.63

## Appendix B

### PROJECTED COST ANALYSIS FOR FY 92

1. Workload projection:	WAMC	1820 patients
	FVAMC	<u>260</u> patients
Annual workload:		2080
2. Personnel:	Radiologist	\$140,000
	Radiology tech	35,000
	Radiology tech	35,000
	Clerk/typist	<u>20,000</u>
		\$230,000
3. Consumable supplies:		\$ 60,000
Operational supplies:		<u>15,000</u>
		\$ 75,000
4. Maintenance:	\$0 (Under warranty)	
5. Annual operating costs:		\$305,000
(Items 2 + 3)		
6. Cost per scan:	\$305,000 divided by 2080 = \$146.63	
(Annual operating costs divided by annual workload)		

## Appendix C

### PROJECTED COST ANALYSIS FOR FY 93

1. Workload projections:	WAMC	* 1560
	FVAMC	<u>520</u>
Annual workload:		2080
2. Personnel	Radiologist	\$140,000
	Rad tech	35,000
	Rad tech	35,000
	Clerk/typist	<u>20,000</u>
		\$230,000
3. Consumable supplies:		\$ 60,000
Operational supplies:		<u>15,000</u>
		\$ 75,000
4. Maintenance:		\$ 62,500
(July, August, September 1993)		
5. Annual operating costs:		\$367,500
(Items 2 + 3 + 4)		
6. Cost per scan:	\$367,500 divided by 2080 = \$176.68	
(Annual operating costs divided by annual workload)		

\* Workload projections based on 6 scans per day for WAMC and 2 scans per day for FVAMC.

## Appendix D

### PROJECTED COST ANALYSIS FOR FY 94

1. Workload projection:	WAMC	1560 patients
	FVAMC	<u>520</u> patients
Estimated annual workload:		2080
2. Personnel:*	Radiologist	\$187,000
	Rad tech	36,444
	Rad tech	32,998
	Rad tech	29,799
	Clerk/typist	<u>21,491</u>
		\$308,232
3. Consumable supplies:**		\$162,000
Operational supplies:		<u>15,000</u>
		\$177,000
4. Maintenance:		\$250,000
5. Annual Operating Costs:		\$735,232
6. Cost per scan:	\$735,232 divided by 2080 = \$353.48	
	(Annual operating costs divided by annual workload)	

\* Personnel costs are estimated to be higher due to hiring of a contract Radiologist vs. using on-hand staff radiologist. There is also an additional Radiology Technician to be hired in FY 94 (for a total of one GS-9, one GS-8, and one GS-7). The figures shown for FY 92 and 93 are based on the original estimates from WAMC.

\*\* Consumable supplies are higher to more accurately reflect actual supply costs (\$50,000 for cryogenics, \$36,000 for film, \$38,000 for contrast, and \$38,000 for developer). The figures shown for FY 92 and 93 are based on the original estimates from WAMC.

## Appendix E

### ADJUSTED COST ANALYSIS FOR FY 93

1. Workload projections:	WAMC	1560 patients
	FVAMC	<u>520 patients</u>
Annual workload:		2080

2. Personnel:	Radiologist	\$250,000
	MRI Tech GS-9	37,975
	MRI Tech GS-8	34,384
	MRI Tech GS-7 or 8	34,384
	Clerk/typist GS-4	<u>\$379,145</u>

3. Supplies:	Cryogen	\$ 43,747
	Film	25,200
	Contrast	33,600
	Developer/misc	33,600
	Optical Discs	<u>\$145,740</u>

4. Maintenance: \$ 62,500

The 12 month maintenance contract is for the period 1 July 93 to 30 June 94, for \$250,000. The figure used in this computation is for the 3 month period, July - September 1993.

5. Equipment:\* \$ 49,492

6. Other/TDY/Training \$ 1,360

7. Annual operating costs: \$588,745  
(Items 2 + 3 + 4 + 6)

\* Item 5 is omitted, as the purchase of new equipment is not included in the agreement.

8. Cost per scan: \$588,745 divided by 2080 = \$283.05  
(Annual operating costs divided by annual workload)

## Appendix F

### ADJUSTED COST ANALYSIS FOR FY 94

1. Workload projection:	WAMC	1560 Patients
	FVAMC	<u>520 Patients</u>
Annual workload:		2080
2. Personnel:	Radiologist	\$250,000
	MRI Tech GS-9	39,570
	MRI Tech GS-8	35,828
	MRI Tech GS-8	35,828
	Clerk/typist GS-4	<u>23,343</u>
		\$384,569
3. Supplies:	Cryogen	\$ 48,122
	Film	27,720
	Contrast	36,960
	Developer/misc	36,960
	Optical discs	<u>10,552</u>
		\$160,314
4. Maintenance:		\$250,000
	(For the period 1 July 94 to 30 June 95)	
5. Other/TDY/Training:		\$ 3,967
6. Annual operating costs:		\$798,850
	(Items 2 + 3 + 4 + 5)	
7. Cost per scan:	\$798,850 divided by 2080 = \$384.06	
	(Annual operating costs divided by annual workload)	



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